CERTIFICATION OF TRANSLATION

I, Jürgen Trendl, hereby certify that I have carefully made the attached English language translation of German Patent Application DE 199 18 829.7, filed with the German Patent and Trade Mark Office on April 22, 1999, entitled

"Verfahren zur Qualitätskontrolle für digitale Rundfunkübertragung im Mittel- und Kurzwellenbereich"

[QUALITY CONTROL METHOD FOR DIGITAL RADIO TRANSMISSIONS IN THE MEDIUM AND SHORT WAVE RANGE]

written in German, and that the attached translation is an accurate English version of the above-referenced German document to the best of my knowledge and belief.

Signed in Mannheim on December 2, 2004

Jürgen Trendl

Jürgen Trendl
vom Präsidenten des Landgerichts
Frankenthal (Pfalz) ermächtigter Übersetzer der spanischen und englischen
Sprache für die Gerichte und Notare des
Landes Rheinland-Pfalz

[Stamp: Jürgen Trendl - Translator of Spanish and English, authorized by the President of the District Court at Frankenthal (Palatinate) to translate for courts and notaries in the State of Rhineland-Palatinate]

Specification

[0001] The present invention relates to the field of quality control for digital radio program transmissions in the medium and short wave range.

[0002] Digital signal transmissions, as can already be gathered from the term "digital", have the characteristic that either they deliver a virtually error-free audio signal or else that the audio signal is not usable and the receiver switches to muting. The quality of the received high frequency signal determines the threshold above which the audio quality is perfect and below which no audio reception is possible.

[0003] In physical terms, this behavior is due to the fact that the error curves for the bit errors (or also **[for]** the symbol errors) decrease very steeply as the ratio of received signal energy/noise level increases. This means virtually that, above a certain threshold (L) of signal energy/noise level, the bit error rate goes toward negligibly small values. The then still remaining residual errors can be corrected by the audio decoder, resulting in a perfect audio quality.

[0004] In the medium and, even more strongly in the short wave range, propagation-related fading phenomena occur which are irregular in time and which, inter alia, result in that the received signal energy heavily decreases and/or in that the noise level heavily increases. Because of this, the reception threshold is undershot so that muting occurs.

[0005] According to the related art, there is the concept of hierarchical modulation for preventing a "sudden threshold" as viewed by the receiver. In this connection, the transmitted data stream is composed in such a manner that the receiver can detect the entire data stream for a large signal-to-noise ratio and, for a decreasing signal-to-noise ratio, reaches a first threshold (L_1) beyond which only a part of the data stream is detectable. This is the "rugged" part of the data which the aid of which a limited audio quality is still attainable. After a second threshold (L_2), the receiver is then mute again. A method of this kind is referred to as "Graceful Degradation".

[0006] From a standpoint of coverage, it should be observed that the threshold values are **[to each other]** as follows:

$$L_1 > L > L_2$$

[0007] This means virtually that, in the case of hierarchical modulation, the coverage radius (R_1) with maximum audio quality is smaller than that (R) in the case of non-hierarchical modulation. On the other hand, in the case of hierarchical modulation, the transmitter can at least still be received with limited quality within a greater coverage radius (R_2). For the coverage radii, it is applying that:

$$R_1 < R < R_2$$

[0008] However, definitely definable coverage radii exist only in the case of the propagation at very high frequencies, for example, beyond the VHF range. At these high frequencies, no total fading occurs any more as it arises so often with the medium and short wave.

[0009] The use of a "Graceful Degradation" in the short wave range is therefore in controversy. On one hand, a reduction in quality at the receiving side is preferable to a complete muting even at the cost of limitations:

- coverage radius with full quality decreases,
- the broadcast transmitter can no longer adjust the data rate for the audio data so flexibly as in the case of a non-hierarchical coding,
- steep, longer-lasting fades give rise to an extremely short time range for the reduced quality which **[time range]** hardly becomes noticeable.

[0010] On the other hand, a hierarchical coding/modulation in the receiver is more expensive; above all, it has to be implemented in every receiver. This is contradicts the concept of the cheap receiver. A scalability of the receivers in terms of price from cheap to high quality is probably more important.

[0011] Provided as alternatives to "Graceful Degradation" according to the present invention are:

- Preselecting a stronger coding/modulation for critical target areas.
- Using alternative transmitting frequencies for the transmission of the same program in conjunction with an automatic switchover.

[0012] To assess the real receiving situation, a monitor station is required in the target area from which **[monitor station]** the parameters of the received high frequency signals are automatically transmitted to the broadcast transmitter. In this manner, "intelligence" is transferred from the receiver into the transmitter, which complies with the concept of broadcasting.

[0013] The interrogation of quality data from the monitor station can be effected via the Internet. An automatic feedback is also possible via the Internet. This feature can be implemented by each broadcasting corporation separately and independently.

[0014] In the case of target areas which do not permit any monitor stations, it is possible to determine an estimate for the propagation via monitor stations in adjacent areas.

Patent Claims

1. A quality control method for digital radio transmissions in the medium and short wave range,
wherein at least one receiver station is located in the target area or adjacent thereto which **[receiver station]** evaluates the quality data of the received high frequency digital signal and determines the appertaining parameter values;
the determined parameter values are transmitted to the broadcast transmitter;
the transmission of the determined parameter values to the broadcast transmitter is carried out automatically via the Internet; and
the parameter values transmitted to the broadcast transmitter are used for influencing the number of modulation stages and/or the coding of the broadcast transmission or for determining alternative transmit frequencies.

2. The method as recited in Claim 1,
wherein the parameter values which are determined by the receiver station in the target area and transmitted to the broadcast transmitter are stored in a data base for frequency prognoses.